

*BIOENERGY PRODUCTION IN RURAL AREAS: CREATION OF A BIOMASS MARKET IN MEDITERRANEAN AGRICULTURE AND FOREST AREAS AND IN OTHER REGIONS DEALING WITH CLIMATE CHANGE AND A DECLINE IN AVAILABLE WATER RESOURCES*

# **Environmental impacts of energy crops and environmental problems related to abandonment of marginal croplands in a Mediterranean area**

8th and 9th of September, 2011

Antonio Robledo Miras





# Marginal croplands

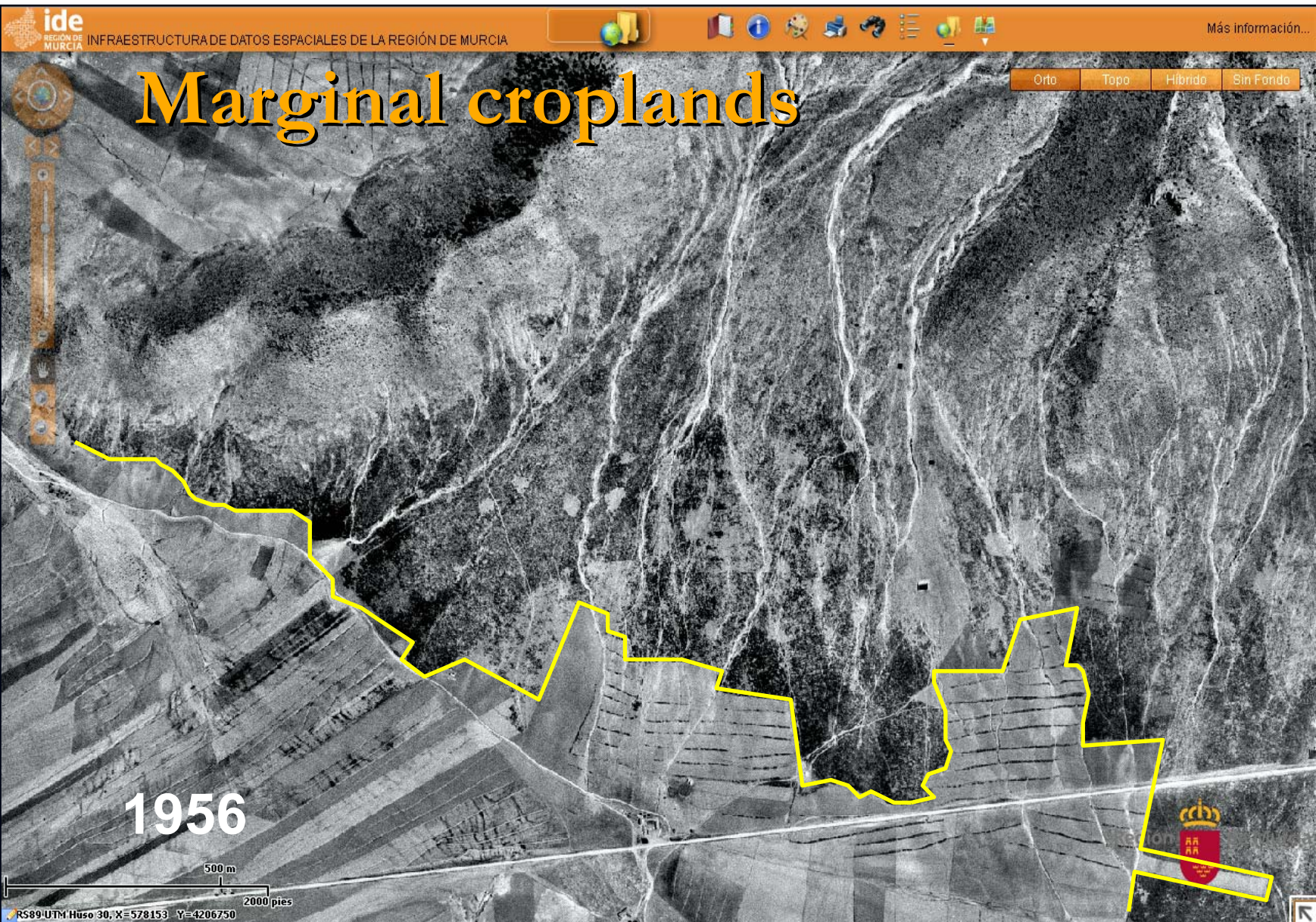
► Accessibility

► Soil condition

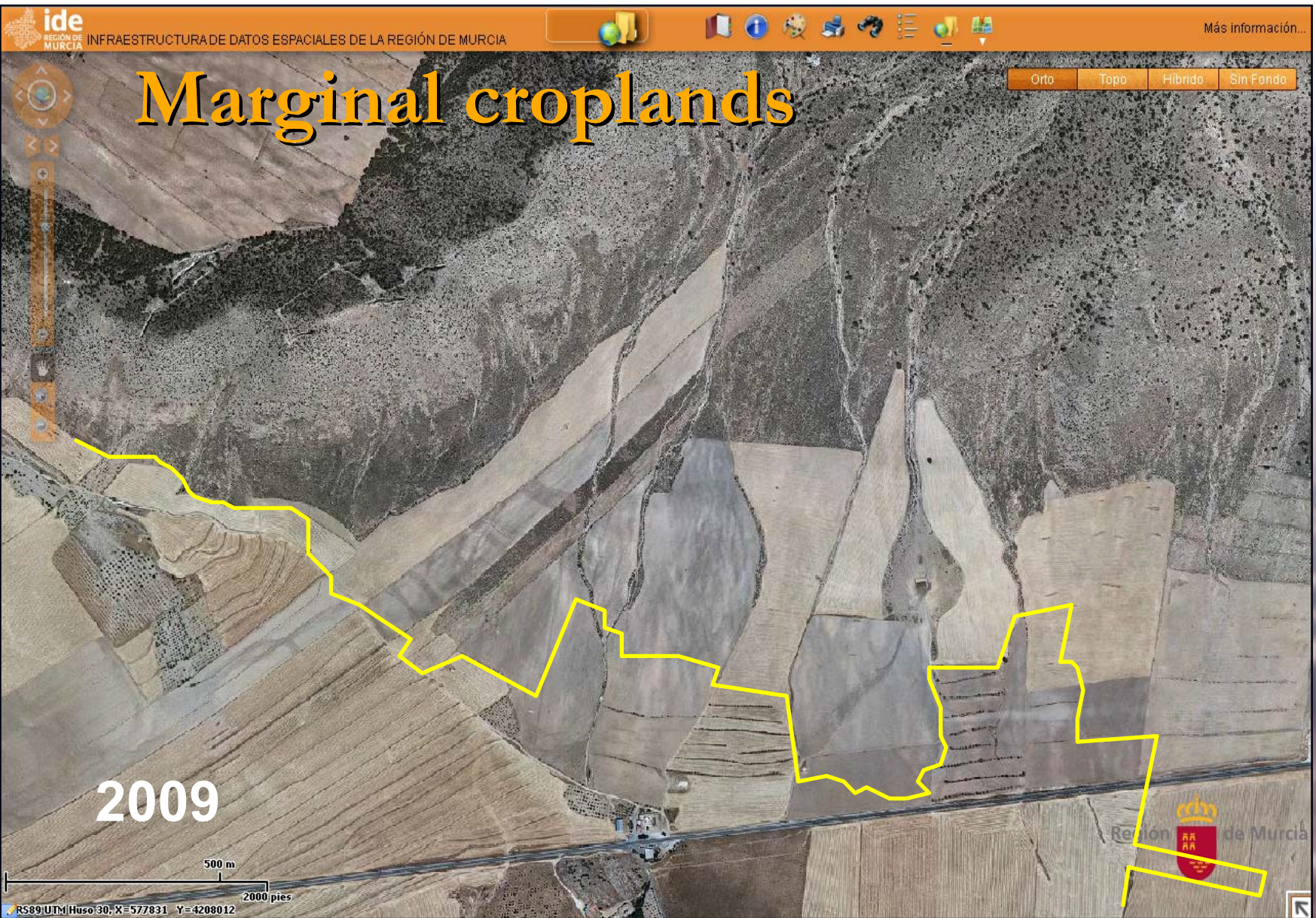
► Cultivated species

► Economic  
profitability



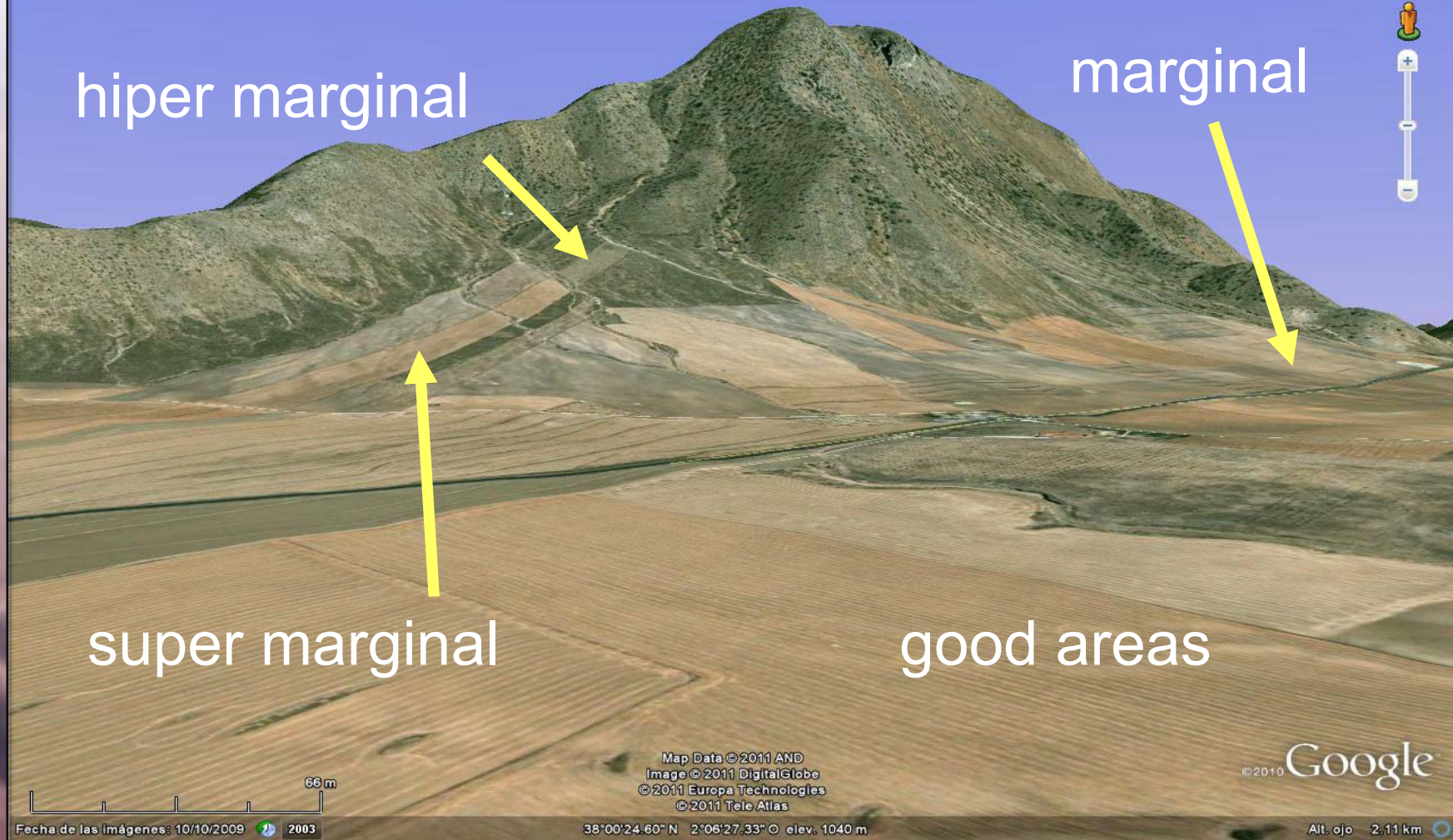








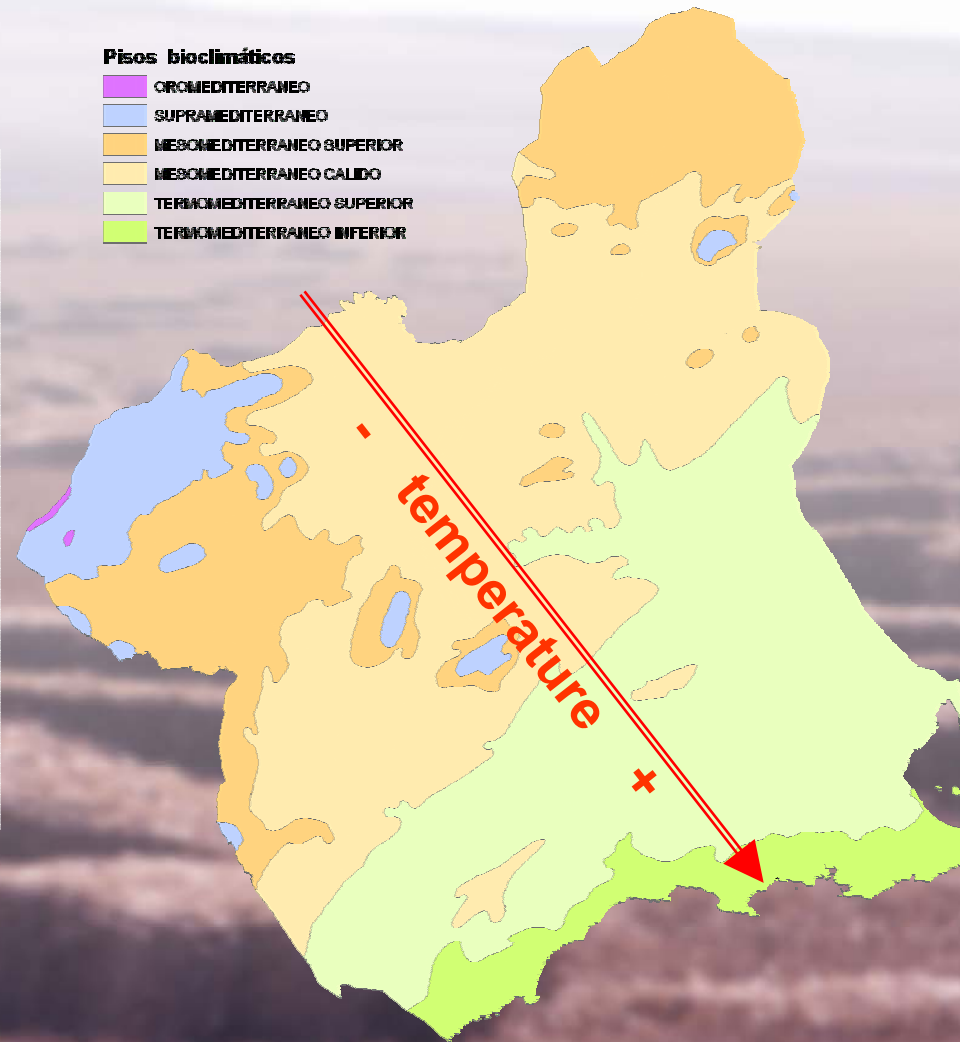
# Marginal croplands





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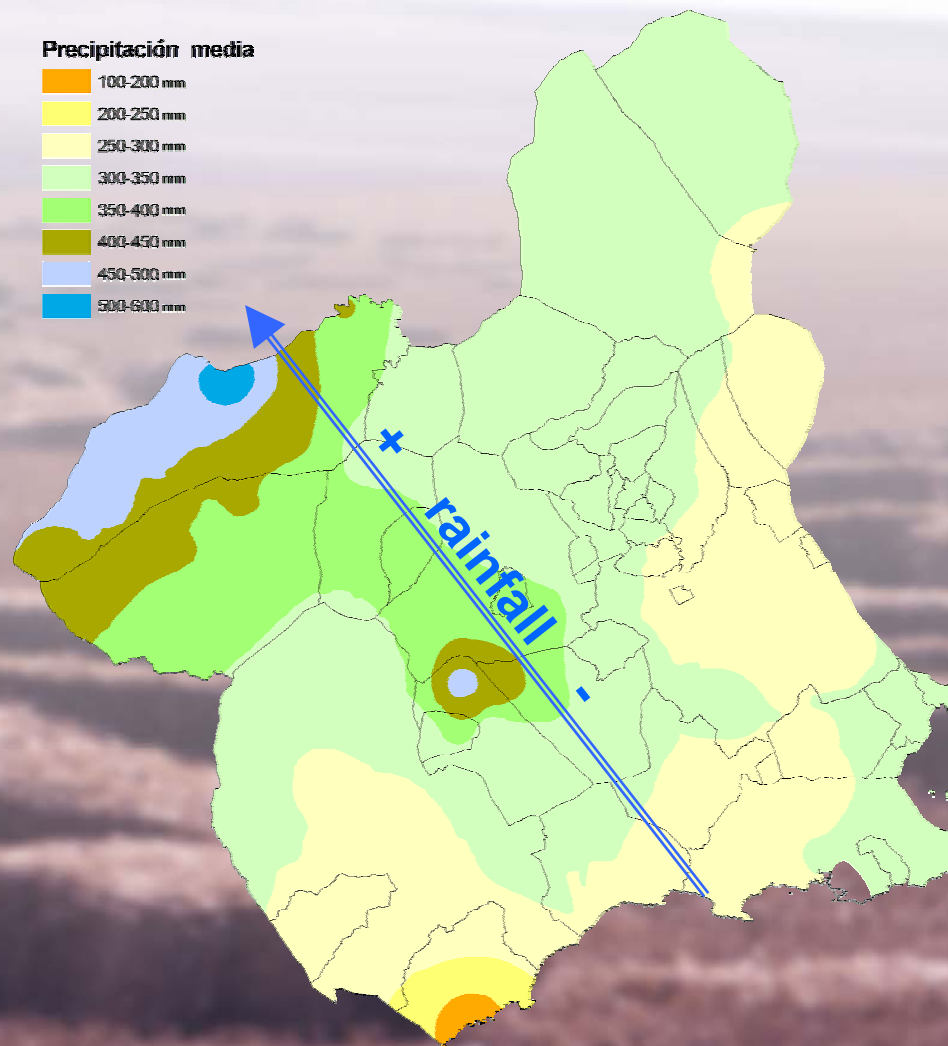
- mediterranean climate
- rainfall 250 – 500 mm anual average
- irregular and stational rainfall
- 11 °C a 18 °C anual average
- soft winter in low areas





# Marginal croplands

- **mediterranean climate**
- **rainfall 250 – 500 mm anual average**
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- **11 °C a 18 °C anual average**
- **soft winter in low areas**

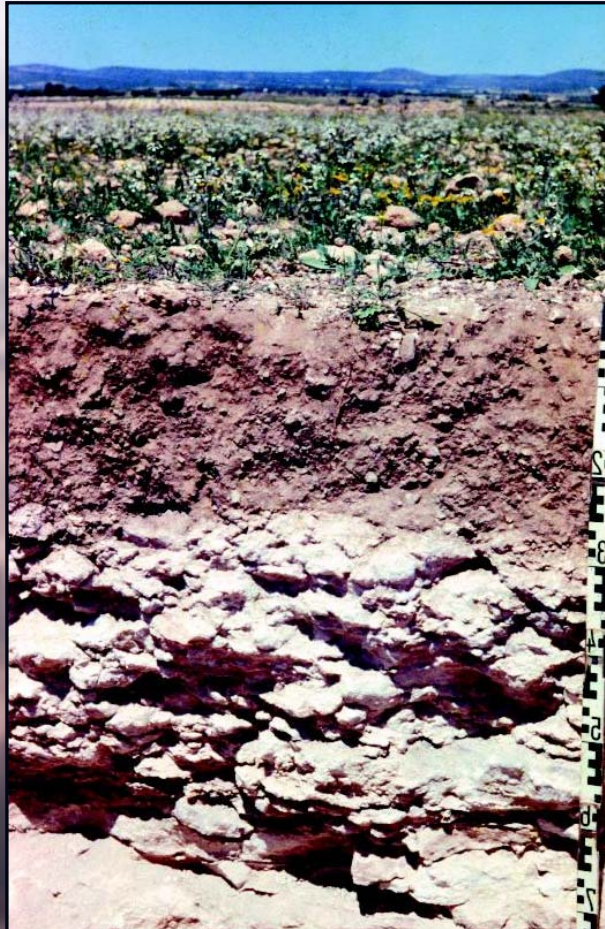




# Marginal croplands



good soils are scarce



bad soils are common





# Abandonment of marginal crop problems

- Disappearance of the local population
- Cultural loss of knowledge and traditions
- Destruction of traditional agricultural structures
- Increase in erosive processes on slopes
- Development of the scrub as fuel in case of fire
- Disappearance of the fauna and flora linked to crops

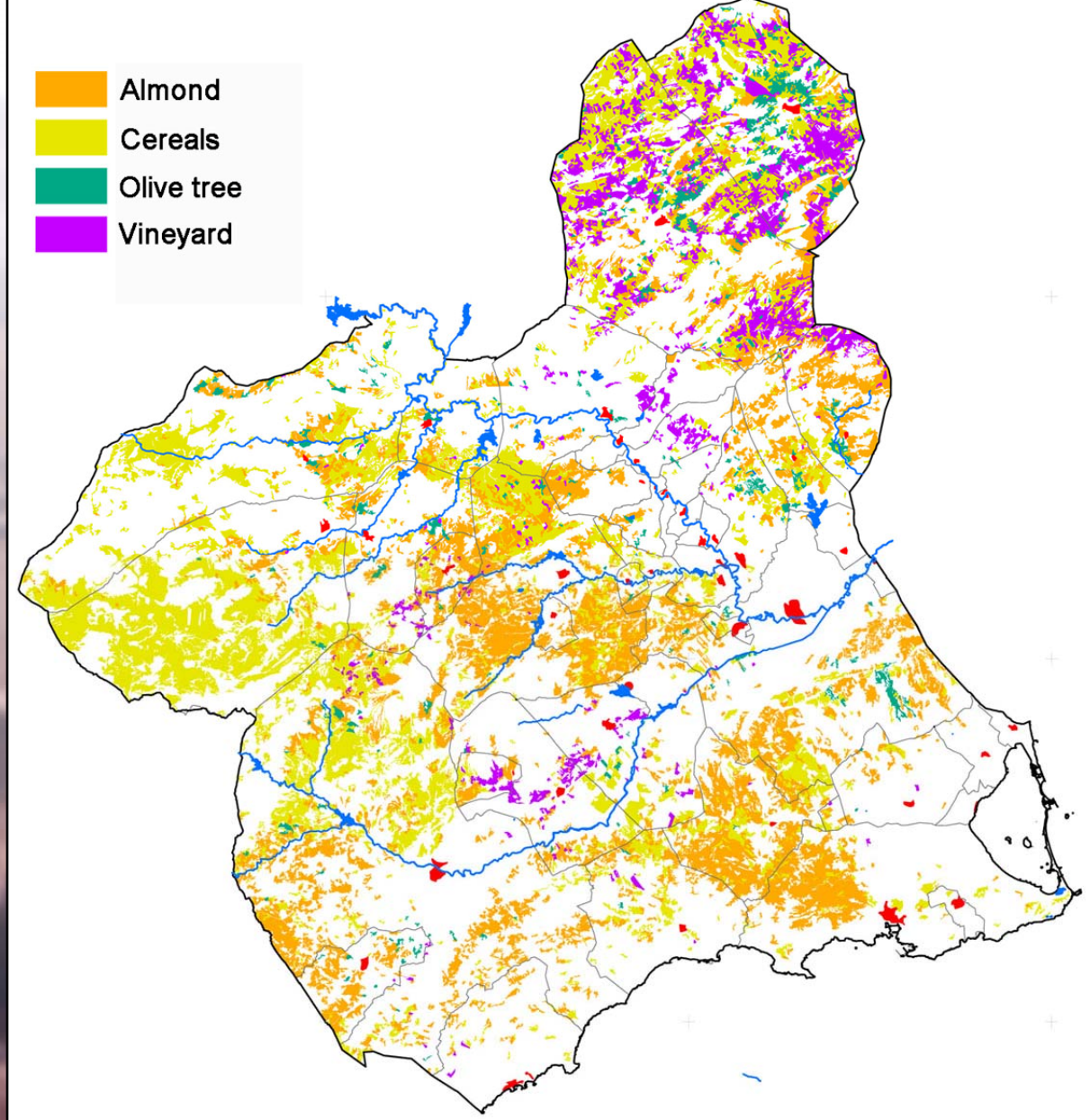


# Land evolution (ha) in Murcia

|                      | 2002           | 2004           | 2006           | 2008           | 2010           |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| <b>TOTAL SURFACE</b> | 1.131.398      | 1.131.398      | 1.131.398      | 1.131.398      | 1.131.398      |
| <b>ARABLE LANDS</b>  | <b>606.019</b> | <b>605.839</b> | <b>566.623</b> | <b>561.479</b> | <b>554.364</b> |
| Arable crops         | 112.978        | 115.167        | 109.700        | 99.733         | 96.439         |
| Fallow and other     | 269.245        | 275.396        | 245.727        | 252.652        | 258.130        |
| Tree crops           | 223.796        | 215.276        | 211.196        | 209.094        | 199.795        |
| <b>NATURAL LANDS</b> | <b>436.807</b> | <b>436.807</b> | <b>440.573</b> | <b>445.333</b> | <b>449.266</b> |
| Forest               | 169.810        | 169.810        | 172.129        | 173.123        | 168.480        |
| Scrubland            | 105.539        | 105.539        | 104.580        | 104.782        | 117.490        |
| Esparto grass        | 86.215         | 86.215         | 86.475         | 89.645         | 89.008         |
| Pastures             | 75.243         | 75.243         | 77.389         | 77.783         | 74.288         |
| <b>OTHER LANDS</b>   | <b>88.912</b>  | <b>89.092</b>  | <b>124.202</b> | <b>124.586</b> | <b>127.768</b> |





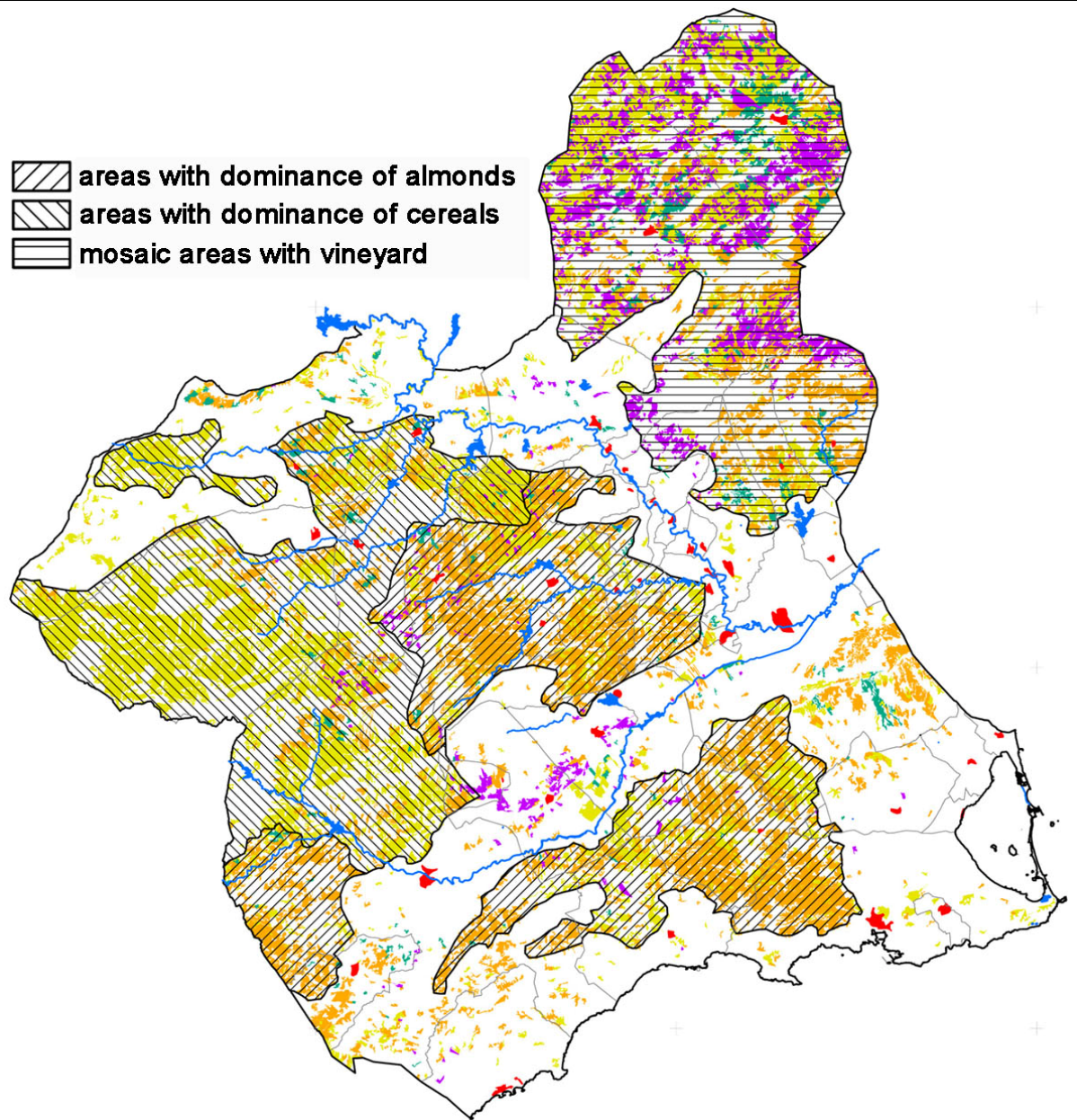
# Objective crops





# Objective areas

-  areas with dominance of almonds
-  areas with dominance of cereals
-  mosaic areas with vineyard





# ¿Agriculture paradox?

The expansion of agriculture has produced intense impacts on the natural environment



Loss of the “Great Nature”:  
bears, wolves, birds of prey,  
large herds of hoofed animals,  
plants, .....

The abandonment of agricultural activity produces a decrease in local biodiversity



Loss of the “Little Nature”:  
small carnivores, small  
and steppe birds,  
invertebrates, weeds, .....



# Biomass crops: baseline

- No ploughing natural areas from new cultures
- Not utilize very marginal lands, which should be returned to a natural dynamic (forestry, livestock)
- Adapted plants to local conditions
- No monocultures
- Diversify the landscape
- Ecological crops management
- Promoting wild and cinegetic fauna



# Environmental impacts of energy crops

- Disappearance of the old crop
- Change of land management
- Change in the landscape
- Change of associated fauna
- Change of spontaneous flora
- Some biomass-plants may behave as invasive
- New pests and diseases
- Ecosystem global change



# Change of land management

- Use of perennial biomass-plants
- Decrease in plowing and improvement of soil structure
- Use of urban and livestock waste, not tolerable for food crops
- Decline in employment of phytochemicals
- Changes in the schedule and the logistics of the production
- They will not produce residual products of cereal crops for livestock



# Fauna

- Many animal species rely on rain-fed crops, especially in marginal crops



main food



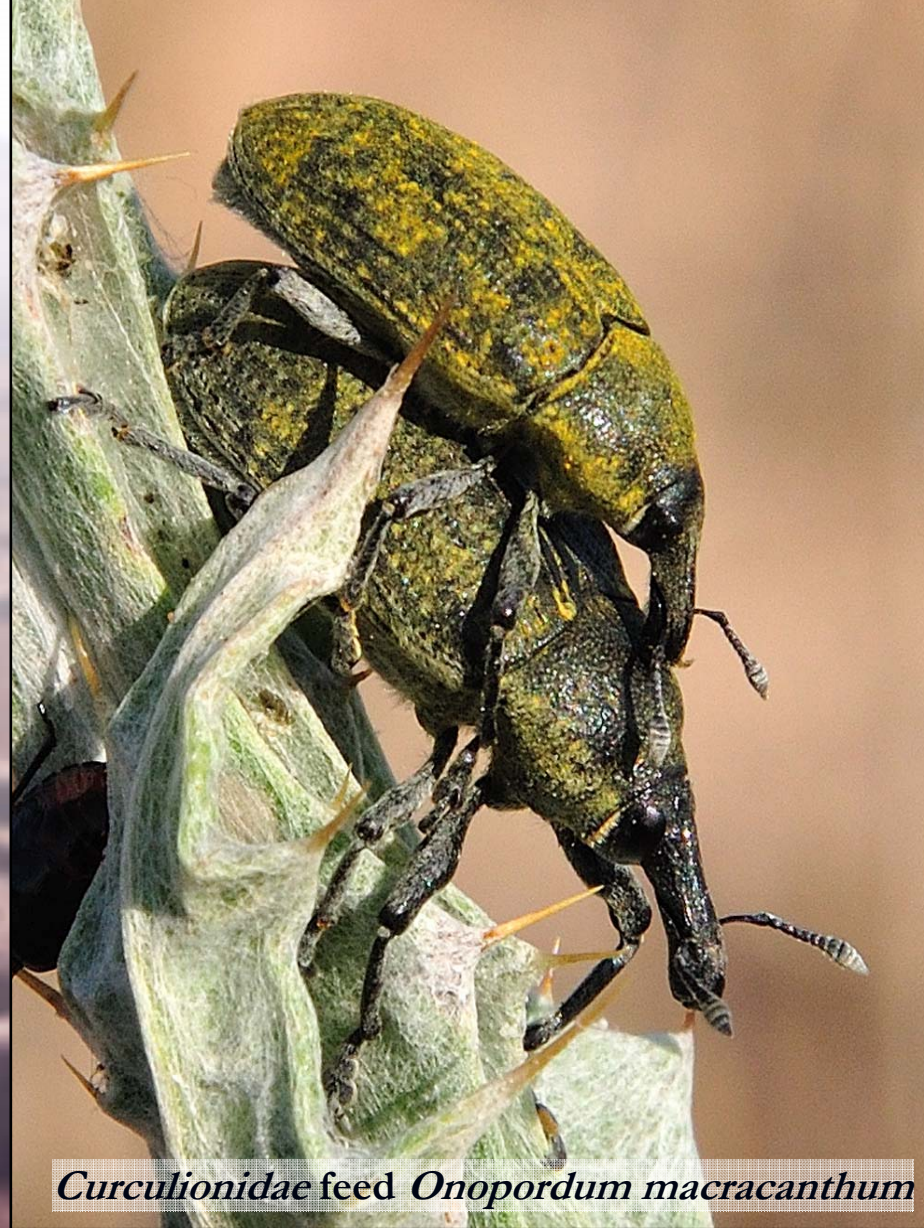
main food





# A new balance?

- New cultivated plants will bring new plagues of insects and other pest
- There will be a major change in the invertebrate herbivores, as many of them depend on one or few plant species
- The new biomass-plants already have natural predators today, that will be enhanced in the future.



*Curculionidae* feed *Onopordum macracanthum*



# A new balance?

- *Aethiessa floralis*
- *Netocia morio*
- *Cetonia carthami*

- These large beetles feed on the flowers and seeds of thistles.

- The loss of biomass is small but they can produce large loss of seeds





# A new balance?

## *Megascolia bidens*

- The females parasitize the larger larvae of beetles; after chop them with the sting to paralyze them, introduce an egg inside, and there the larvae will develop





# A new balance?

- The biomass-plants can produce food that favor some species of birds
- Losses in seed production

*Carduelis carduelis*



<http://elsilvestrismo.blogspot.es/>



*Silybum marianum*

# Steppe birds

- Agro-steppes: land open with cereal cultivation not irrigated and extensive grazing.
- Greater importance in Spain, both the huge area it occupies and its relevance to economic, social and landscape
- Threatened or endangered bird species: *Otis tarda*, *Tetrax tetrax*, *Burhinus oedicephalus*, *Pterocles alchata*, *Pterocles orientalis*, *Circus cyaneus*, *Circus pygargus*, .....
- Most important threats:
  - processes of intensification
  - increase of chemical compounds (fertilizers, pesticides)
  - poisoning or diminishes the fauna of invertebrates
  - change in the traditional agricultural calendar
  - rain-fed irrigation implementation
  - reforestation of agricultural lands
  - **BIOMASS CROPS ?**



# Steppe birds

- Lek: grouping of males who compete for mating with females, gathering in specific places for exhibitions. Lek is always held on the same territory





# Spontaneous flora

- Important flora associated to rainfed crops
- Rare or threatened plant species
- Use of herbicides, with some extremely sensitive species
- New weeds from new crops





# Positive impacts

- Contribute to the reduction of greenhouse gas emissions
- Reduce the energy dependency of the oil-producing countries
- Maintenance of agricultural activity, that can replace marginal crops or not profitable
- Implementation of environmentally friendly farming techniques
- Appearance of new habitats for the wildlife and hunting
- Consider the impact on susceptible animal species change of cultivation, as especially the steppe birds
- Maintenance of the rural population that participates in the custody of territory

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*thanks*

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